

**WORLDWIDE EMERGING ENVIRONMENTAL ISSUES AFFECTING THE U.S. MILITARY**  
Subcontract No: 1048, LMI Task No: MAN0B.04, for the U.S. Army Environmental Policy Institute

**NOVEMBER 2010 REPORT**

Note to Readers: Pages 1-12 comprise the summary and analysis of this report. Expanded details for some items are in the Appendix beginning on page 13.

<b>Item 1. NATO's New Strategic Concept Includes Environmental Security.....</b>	<b>1</b>
<b>Item 2. International Consortium Created to Curb Environmental Crime.....</b>	<b>1</b>
<b>Item 3. Food Security Threatened by Diminishing Low-Cost Phosphorus.....</b>	<b>2</b>
<b>Item 4. Renewed Protection for Refugees in Latin America.....</b>	<b>2</b>
<b>Item 5. Technological Advances with Environmental Security Implications.....</b>	<b>3</b>
5.1 New Insights into Photosynthesis Could Change Energy Storage and Transmission. ....	3
5.2 New Detection and Cleanup Techniques.....	3
5.3 New Technologies for Improving Marine Monitoring.....	4
<b>Item 6. Updates on Previously Identified Issues.....</b>	<b>5</b>
6.1 New International Mechanisms Adopted for Protection of Biodiversity.....	5
6.2 Revised Standards Proposed for Corporate Greenhouse Gas Reporting.....	6
6.3 New EU Directive on Industrial Pollution.....	6
6.4 Comments Invited on EPA/DOT Proposed Heavy Truck Mileage/Emission Standards....	7
6.5 New Protected Areas Proposed in the Pacific.....	7
6.6 Hazardous E-waste Grows as Major Environmental Problem.....	8
6.7 Climate Change.....	8
6.7.1 Scientific Evidence and Natural Disasters.....	8
6.7.2 Food and Water Security.....	8
6.7.3 Migration.....	9
6.7.4 Adaptation.....	9
6.7.5 Health.....	9
6.7.6 Post-Copenhagen Negotiations.....	10
6.8 Nanotechnology Safety Issues.....	11
<b>Item 7. Reports and Information Suggested for Review.....</b>	<b>11</b>
7.1 Literature Addressing Arctic Security.....	11
7.2 Economic Argument for Peace-building in Sudan.....	12
<b>Appendix.....</b>	<b>12</b>

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE <b>NOV 2010</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2010 to 00-00-2010</b>	
4. TITLE AND SUBTITLE <b>Worldwide Emerging Environmental Issues Affecting the U.S. Military. November 2010</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>The Millennium Project,,4421 Garrison Street, N.W.,Washington,DC,20016-4055</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>19</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

**Item 1. NATO's New Strategic Concept Includes Environmental Security**

“Key environmental and resource constraints, including health risks, climate change, water scarcity and increasing energy needs will further shape the future security environment in areas of concern to NATO and have the potential to significantly affect NATO planning and operations”, reads NATO’s new Strategic Concept for the next decade, adopted at the alliance’s Summit meeting in Lisbon, November 2010. The new roadmap was updated considering modern threats such as energy security, cyber attacks, and the security impacts of emerging technologies, along with and in the context of the spread of terrorism and extremist groups. It stipulates that, —A number of significant technology-related trends – including the development of laser weapons, electronic warfare and technologies that impede access to space – appear poised to have major global effects that will impact on NATO military planning and operations.” In the spirit of enhancing EU-NATO cooperation, an EU-US Working Group on Cyber-security and Cybercrime was established to address specific priority areas, and an agreement on the Terrorist Finance Tracking Program was negotiated.

**Military and Related Security Implications:**

Referencing the quotation above from the strategic concept adopted in Lisbon, the Army Strategy for the Environment should be made available to all relevant personnel in NATO, with suggestions for collaboration on how environmental security aspects in crisis management, conflict resolution, and general strategic planning might be enhanced.

**Sources:**

Active Engagement, Modern Defence. Strategic Concept for the Defence and Security of the Members of the North Atlantic Treaty Organisation adopted by Heads of State and Government in Lisbon [http://www.nato.int/cps/en/natolive/official\\_texts\\_68580.htm](http://www.nato.int/cps/en/natolive/official_texts_68580.htm)

EU-US Summit in Lisbon, Portugal: Joint Statement

[http://eurunion.org/eu/index.php?option=com\\_content&task=view&id=3926&Itemid=58](http://eurunion.org/eu/index.php?option=com_content&task=view&id=3926&Itemid=58)

**Item 2. International Consortium Created to Curb Environmental Crime**

The International Consortium on Combating Wildlife Crime (ICWC) came into effect, by the signing of a Letter of Understanding by the heads of five organizations: INTERPOL, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the UN Office on Drugs and Crime (UNODC), the World Bank, and the World Customs Organization. In the same spirit, the resolution adopted by INTERPOL’s 79<sup>th</sup> General Assembly, attended by 650 delegates from 141 countries, underlines that environmental crime is —mul-disciplinary in nature due to the complexity and diversity of crime types.” Since it is ~~not~~ restricted by borders and involves organized crime networks...”, a global response is needed, with INTERPOL and the National Central Bureaus playing a leading role. The resolution also stipulates that environmental crime impacts the global economy and security, and recommends that INTERPOL form the Environmental Crime Committee.

**Military and Related Security Implications:**

AFRICOM and military personnel in other regions working in countries with governments with weak local customs or security organizations should consider how they might conduct military-to-military activities to help implement the intentions of the Consortium and explore

cooperation on the full range of international environmental crime-related activities with the Consortium.

**Sources:**

World's police at INTERPOL General Assembly rally against environmental crime

<http://www.interpol.int/Public/ICPO/PressReleases/PR2010/News20101110.asp>

Powerful alliance to fight wildlife crime comes into effect

<http://www.interpol.int/Public/ICPO/PressReleases/PR2010/PR098.asp>

AG-2010-RAP-08, Appendix. Resolution: Subject: Sustainable Environmental Crime Programme

[http://www.cites.org/eng/news/press/2010/20101108\\_Interpol\\_resolution.pdf](http://www.cites.org/eng/news/press/2010/20101108_Interpol_resolution.pdf)

### **Item 3. Food Security Threatened by Diminishing Low-Cost Phosphorus**

Professor Dana Cordell of the University of Technology in Sydney estimates that world phosphate demand is over 150 million tons per year, that demand will exceed production by 2033, and states, “There is nothing on the market that can replace phosphate on the scale that we need it.” Phosphate is critical for life support and essential for agriculture. U.S. reserves might be exhausted by 2050. Since the lower concentration phosphate deposits are laced with radioactive elements like uranium and thorium, or heavy metals like cadmium, environmental concerns might complicate their exploitation. Addressing phosphorus supply and its environmentally sustainable exploitation and use should be part of strategies addressing food and environmental security.

**Military and Related Security Implications:**

Phosphorus use, conservation, and long-term supply should be added to long-term strategic studies and programs for management of scarce materials and resources for conflict prevention.

**Sources:**

Elemental Shortage

<http://www.the-scientist.com/article/display/57777/>

The Story of Phosphorus: Sustainability implications of global phosphorus scarcity for food security

<http://urn.kb.se/resolve?urn=urn:nbn:se:liu:diva-53430>

### **Item 4. Renewed Protection for Refugees in Latin America**

The “Brasilia Declaration on the protection of refugees and stateless persons in the Americas” was adopted by the delegates of 18 Latin American countries meeting in Brasilia, Brazil, November 11, 2010. In addition to renewed pledges stipulated in previous treaties, the Declaration calls for improved mechanisms for the protection of refugees, migrants, internally displaced, and stateless persons in Latin America by addressing new displacement situations. It reiterates the, —.unrestricted respect for the principle of non-refoulement (non-forced return), including non-rejection at the border and indirect non-refoulement, as well as for the nonpenalization of illegal entry, and non-discrimination, as the fundamental principles of international refugee law”. Since climate change-related factors are expected to increase the number of displaced people around the world, new approaches for potentially larger numbers of such displaced persons seem necessary. The UN High Commissioner for Refugees considers the Declaration, —.a valuable international precedent”, which could help, —.accelerate global efforts to improve the situation of

displaced people and end the scourge of statelessness,” and encourages other world regions to follow the example.

**Military and Related Security Implications:**

SOUTHCOM and other military and security personnel in Latin America should consider the implications of future increasing environmental refugees in light of the principles stipulated in the Declaration, when designing security strategies.

**Sources:**

Latin America nations pledge more for the protection of the displaced and stateless

<http://www.unhcr.org/4cdd4dc09.html>

UN lauds Latin America’s declaration on refugee protection

<http://www.globalsecurity.org/military/library/news/2010/11/mil-101112-unnews01.htm>

Brasilia Declaration on the Protection of Refugees and Stateless Persons in the Americas

<http://www.unhcr.org/4cdd3fac6.html>

## **Item 5. Technological Advances with Environmental Security Implications**

### **5.1 New Insights into Photosynthesis Could Change Energy Storage and Transmission**

Researchers at MIT have observed the maximal efficiencies of chromophores (light-sharing molecules active in photosynthesis) via a laboratory-based construct of artificial self-assembling molecules. The researchers believe they now have a macro-understanding of the photosynthetic process. With this new understanding, scientists in the field believe synthetic chemical systems based on photosynthesis have the potential to store and transmit solar energy with far greater performance ratios than today’s photovoltaic technology. [Related item: *Photoelectric Energy Efficiency Increase by Photosynthesis-type Semiconductor Structure* in March 2009 environmental security report.]

**Military and Related Security Implications:**

This research offers key insights into harvesting nature’s most abundant renewable energy source and should be followed to reduce oil-dependency and lessen the military environmental footprint.

**Source:**

Fine-tuning photosynthesis

<http://web.mit.edu/newsoffice/2010/fine-tuning-photosynthesis.html>

### **5.2 New Detection and Cleanup Techniques**

#### 5.2.1 Novel Micro-enabling Technology Potentials to Improve Detection Efficiency

Sphere Fluidics, a University of Cambridge spin-out company, states that the use of, “...an integrated microfluidics and picodroplets system for rapid analysis, isolation and discovery of single (and small populations of) cells and molecules...”, offers efficiency, control and automation advantages to existing systems of analysis and detection. Applications to energy, health, and chemical investigation are anticipated and in progress. [Related item: *New Substrate Preparations Make for Inexpensive “Labs on a Chip”* in October 2008 environmental security report.]

**Military and Related Security Implications:**

Military and security personnel concerned with cellular and molecular detection, computation, and analysis should consider the techniques and/or contacting the company for possible partnership, for improving detection systems.

**Sources:**

Miniature droplet technology receives Royal Society Enterprise Fund backing

<http://royalsociety.org/news/miniature-droplet-technology/>

Sphere Fluidics

<http://www.spherefluidics.eu/>

**5.2.2 Portable Virus Detector Could Check Pandemics**

A team at the A\*STAR Institute of Bioengineering and Nanotechnology (IBN) in Singapore, led by Pavel Neuzil, reports developing a portable device for rapid detection of viruses in the environment. The unit implements a real-time polymerase chain reaction capability by using a silicon-based micromachined ‘lab-on-a-chip’, replacing the conventional light source with a light-emitting diode, and replacing the photomultiplier tube with a photodiode. The developers claim that the system can detect H5N1 viruses in as little as 35 minutes and is some 50 times cheaper than competing devices. This technology, when commercialized, could greatly improve the efficiency of detecting pathogenic organisms in the environment.

**Military and Related Security Implications:**

Relevant military and security personnel should explore the use of this technology to see if, indeed, it is better than current systems.

**Sources:**

Sensors: A portable device for virus detection

<http://www.nanowerk.com/news/newsid=18701.php>

Rapid detection of viral RNA by a pocket-size real-time PCR system (by subscription only)

<http://pubs.rsc.org/en/Content/ArticleLanding/2010/LC/c004921b>

**5.3 New Technologies for Improving Marine Monitoring****5.3.1 New Super-efficient Undersea Marine Research Robot**

Engineers at the Monterey Bay Aquarium Research Institute in Moss Landing CA have announced a highly efficient autonomous underwater vehicle that is fast, capable of carrying instruments and also designed for long-term expeditions. The LRAUV (long-range AUV) runs on batteries and incorporates power-saving and internal control software allowing it to monitor its own energy use and make intelligent choices about how to pursue its mission. The robot is claimed to be flexible enough for inclusion in most scientific excursions and is designed to work as a member of a group. The next phase of MBARI experimentation will monitor marine ecology using two units.

**Military and Related Security Implications:**

This new technology should be investigated for its ocean research and environmental monitoring capabilities.

**Source:**

New long-range undersea robot goes the distance

[http://www.mbari.org/news/news\\_releases/2010/lrauv/lrauv-release.html](http://www.mbari.org/news/news_releases/2010/lrauv/lrauv-release.html)

**5.3.2 Cost-Effective Real-Time Electronic Monitoring for Coastal Ecosystems**

Researchers from North Carolina State University led by Prof. Alex Dean report developing a cost-effective electronic monitoring system that will enable researchers to advance ... understanding of critical coastal ecosystems by allowing users to track water-quality data ... in real time.” The system uses inexpensive, wireless sensors that can be anchored to the seabed, moored to buoys, or towed behind vessels to collect data, which is then transmitted to a central server. This project is "open source" and should enable other institutions concerned with coastal environments to develop their own efforts more efficiently.

**Military and Related Security Implications:**

This new technology should be investigated for its potential in environmental cleanup of coastal military damage and environmental monitoring capabilities.

**Source:**

Researchers Developing Real-Time Electronic Monitoring For Coastal Waters

<http://news.ncsu.edu/releases/wmsdeanbaysensors/>

**Item 6. Updates on Previously Identified Issues**

**6.1 New International Mechanisms Adopted for Protection of Biodiversity**

The 10<sup>th</sup> Conference of the Parties of the Convention on Biological Diversity (CBD) held in Nagoya, Japan, adopted several new mechanisms for increasing protection of biodiversity and assessed new and emerging issues. The 2011-2020 Strategic Plan for Biodiversity identifies 20 targets, such as: expanding the world’s protected areas to include 17% of terrestrial surface and 10% of the marine surface; the restoration of a minimum 15% of ecosystems already degraded; and halving, or bringing as close as possible to zero, the rate of loss of the world’s natural habitats. The “Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization” will enter into force after 50 ratifications. The attendees also agreed that signatories to the CBD must ensure that no geoengineering projects take place until risks to the environment, as well as social, cultural, and economic impacts, have been properly assessed. A sample of other outcomes includes the: Global Biodiversity Outlook; Multi-year Programme of work; Biofuels and Biodiversity; and Invasive Alien Species. [Related item: *Biosafety Regulations Reviewed in Context of Worrying Forecasts* in October 2010 environmental security report.]

**Military and Related Security Implications:**

[Similar to previous on this issue] Increased coherence among biodiversity agreements, UN-related bodies, and capacity building should lead to greater attention being paid to biodiversity impacts of military training and other operations. Military liaisons should explore opportunities for cooperation and applications of the *Army Strategy for the Environment* as this integration evolves with monitoring and enforcement organizations. Also, military and other security personnel should anticipate increased international adherence to the concept of calculating the environmental footprint and an increased number of protected regions.



**Sources:**

COP 10 Outcomes

<http://www.cbd.int/nagoya/outcomes/>

Nagoya biopiracy agreement 'is unexpected success'

<http://www.scidev.net/en/agriculture-and-environment/indigenous-knowledge/news/nagoya-biopiracy-agreement-is-unexpected-success-.html>

No to Geo-Engineering: UN Issues a Moratorium on Efforts to Manipulate the Earth's Climate

[http://www.alternet.org/environment/148768/no\\_to\\_geo-engineering%3A\\_un\\_issues\\_a\\_moratorium\\_on\\_efforts\\_to\\_manipulate\\_the\\_earth's\\_climate](http://www.alternet.org/environment/148768/no_to_geo-engineering%3A_un_issues_a_moratorium_on_efforts_to_manipulate_the_earth's_climate)

Research into the possibility of engineering a better climate is progressing at an impressive rate—and meeting strong opposition

<http://www.economist.com/node/17414216>

**6.2 Revised Standards Proposed for Corporate Greenhouse Gas Reporting**

The World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) released proposed new standards for how companies should report the GHG impact of their supply chains and products. These guidelines supplement the Corporate Accounting and Reporting Standard, which is (in turn) part of the GHG Protocol Initiative, which is a larger framework for calculating and reporting a company's environmental footprint. [Related item: *Corporate CEOs Pledge Actions on Climate Change at UN Global Compact Summit* in July 2007 environmental security report.]

**Military and Related Security Implications:**

Military and their civilian contractors with GHG reporting responsibilities should review the revised standards and plan their appropriate compliance activities.

**Sources:**

New measures emerge for measuring carbon emissions, both corporate and municipal

<http://www.smartplanet.com/business/blog/business-brains/new-measures-emerge-for-measuring-carbon-emissions-both-corporate-and-municipal/11209/>

The GHG Protocol Initiative

<http://www.ghgprotocol.org/standards/product-and-supply-chain-standard>

**6.3 New EU Directive on Industrial Pollution**

The European Commission adopted a stricter policy on industrial emissions. It is merging seven pieces of pre-existing environmental legislation including the IPPC Directive (2008/1/EC, integrated pollution prevention and control). New parameters include a more rigorous process for permits by strengthening the Best Available Techniques (BAT), tightening emission limits for Europe's largest fossil-fuel-fired combustion plants and improving compliance tools for better verification and control. The new Directive comes into force 20 days after publication in the Official Journal, which is expected before the end of 2010. Then the member States have two years to start implementation. [Related item: *EC Enforces Compliance with EU Environmental Regulations* in June 2008 environmental security report.]

**Military and Related Security Implications:**

Military and security personnel deployed in the EU and with work related to industrial plants should be prepared to comply with the new Directive within the provisions of Status of Forces



Agreements. It is also fair to speculate that new regulations will be expanded to any relevant production areas. In the meantime, the BAT offers opportunities to introduce innovations in environmental technologies across operations and installations.

**Sources:**

EU adopts stricter rules on industrial emissions

<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/10/1477&format=HTML&aged=0&language=EN&guiLanguage=en>

The IPPC Directive

<http://ec.europa.eu/environment/air/pollutants/stationary/ippc/summary.htm>

**6.4 Comments Invited on EPA/DOT Proposed Heavy Truck Mileage/Emission Standards**

EPA and the Dept. of Transportation announced a comprehensive, proposed national program to reduce greenhouse gas emissions and improve fuel efficiency of heavy-duty trucks and buses.

This is projected to reduce GHG emissions by nearly 250 million metric tons and save 500 million barrels of oil over the lives of the vehicles produced within the program's first five years. [Related item: *EPA Proposes Tougher Air-Quality Rules* in January 2010 environmental security report.]

**Military and Related Security Implications:**

These standards would have major effects on vehicular procurement. The proposal should be reviewed for its probable consequences, so that adequate planning can be instituted. Comments are invited by January 3, 2011.

**Sources:**

New Truck Emission Standards and Controls

[http://www.enn.com/top\\_stories/article/41927](http://www.enn.com/top_stories/article/41927)

EPA and NHTSA Propose First-Ever Program to Reduce Greenhouse Gas Emissions and Improve Fuel Efficiency of Medium- and Heavy-Duty Vehicles: Regulatory Announcement

<http://www.epa.gov/otaq/climate/regulations/420f10901.htm>

**6.5 New Protected Areas Proposed in the Pacific**

The Univ. of Queensland Ecology Centre's marine protection blueprint has determined that 50% of the oceans in the southwest of the country will need to be protected in a network of marine sanctuaries to minimize risks to marine life, fish stocks, and ecosystems. The Australian federal government intends to plan new marine sanctuaries in the southwest of Australia. Indonesia has declared a protected zone around three coral-rich islands near Bali. Palau's Minister of the Environment, Natural Resources and Tourism announced the establishment of a marine mammal sanctuary covering over 230,000 mi<sup>2</sup> (600,000 km<sup>2</sup>) of the nation's waters. [Related item: *Factors to Consider in Establishing and Operating Marine Protected Areas* in March 2010 environmental security report.]

**Military and Related Security Implications:**

Maps of these proposed areas should be reviewed for impacts on military operations.

**Sources:**

Blueprint to protect the future of Australia's oceans revealed

<http://www.physorg.com/news/2010-11-blueprint-future-australia-oceans-revealed.html>

Island nation announces Ukraine-sized sanctuary for whales and dolphins

[http://news.mongabay.com/2010/1024-hance\\_mammal\\_sanctuary.html](http://news.mongabay.com/2010/1024-hance_mammal_sanctuary.html)

### **6.6 Hazardous E-waste Grows as Major Environmental Problem**

More than 12 countries participated in the International Hazardous Waste Inspections Exercise at Seaports. The exercise was coordinated by the International Network for Environmental Compliance and Enforcement's (INECE) and the Seaport Environmental Security Network (SESNN). Initial results indicate that 54% of the 72 total targeted inspections showed infringements. —“Illegal waste streams most often encountered during the event were: e-waste wrongly declared as second-hand goods, waste batteries wrongly described as plastic or mixed metal scrap, and cathode ray tubes from television and computer monitors wrongly classified as metal scrap,” said INECE. [Related item: *Half of Transported European Hazardous Waste Could Be Illegal—How Much More Elsewhere?* in April 2008 environmental security report.]

#### **Military and Related Security Implications:**

Military personnel and their civilian contractors with recycling and waste management responsibilities should review their classifications and operations to see if revisions are necessary. The reports of INECE should be circulated to these personnel.

#### **Sources:**

Global Crackdown on Illegal Hazardous Waste Shipping Confirms Benefits of Cross-Border Cooperation

<http://inecesecretariat.wordpress.com/2010/11/02/global-crackdown-on-illegal-hazardous-waste-shipping-confirms-benefits-of-cross-border-cooperation/>

INECE Seaport Environmental Security Network

[www.inece.org/seaport](http://www.inece.org/seaport)

### **6.7 Climate Change**

#### **6.7.1 Scientific Evidence and Natural Disasters**

Unusually heavy rains since mid-September have caused Benin's worst floods in half a century. The UN Office for the Coordination of Humanitarian Affairs reported that floods affected over 680,000 people in two-thirds of the country, and severely damaged schools, hospitals, and infrastructure, and that there were about 850 reported cases of cholera. Since rains were predicted to continue through November, the total devastation is likely to increase.

*Natural Hazards, UnNatural Disasters: The Economics of Effective Prevention*, a joint report by the World Bank and the UN, estimates that by the end of this century, annual global losses from natural disasters could triple to \$185 billion, without calculating the impact of climate change, which could add \$28-68 billion per year from tropical cyclone damages alone. By 2050, the number of people exposed to storms and earthquakes in large cities could double, to 1.5 billion. The report outlines a number of measures to prevent death and destruction from natural hazards, calling for increased spending for early warning systems, particularly weather forecasting.

#### **6.7.2 Food and Water Security**

FAO's *Food Outlook* report notes that global grain production will drop by 2% (63 million metric tons) this year, putting the world —dangerously close” to a new food crisis. The bills for

food import for the poorest countries are predicted to rise 11% in 2010 and by 20% for the low-income food-deficit countries.

The Global Conference on Agriculture, Food Security and Climate Change took place October 31-November 5, 2010, at the World Forum in The Hague, around the theme ‘It’s Down 2 Earth.’ The Conference initiated a roadmap for action which links agriculture-related investments, food security, and climate change. The roadmap focuses on climate-smart agriculture and includes sections on: policies and strategies; tools and technologies; financing for transformational change; forging partnerships; and the way forward. The Conference was a follow-up to the Shared Vision Statement agreed to at the 17th Session of the Commission on Sustainable Development (CSD 17) in May 2009; the next follow-up conference will be hosted by Vietnam in 2012.

The new *Africa Water Atlas* released by UNEP shows how the challenges of water scarcity in Africa are compounded by high population growth, socioeconomic and climate change impacts, and, in some cases, policy choices. UNEP warns that the findings indicate a decline in the availability of water per person in Africa, and that only 26 of the continent’s 53 countries are on track to reach the UN Millennium Development Goals on water. It also features new solutions and success stories across the continent.

#### 6.7.3 Migration

The Tarawa Climate Change Conference held November 9-11, 2010 in Tarawa, Kiribati, as a session of the Climate Vulnerable Forum, concluded with the release of the Ambo Declaration. Participants called for a number of actions, including design of strategies for protecting people displaced within or across borders due to climate change, and establishing a mechanism for climate change disaster risk. The Declaration was adopted by: Australia, Brazil, Canada, China, Cuba, Fiji, Japan, Kiribati, Maldives, Marshall Islands, New Zealand, Solomon Islands, and Tonga.

#### 6.7.4 Adaptation

A technical paper –Guiding principles for adaptation to climate change in Europe” by the European Topic Centre on Air and Climate Change of the European Environment Agency presents a set of guiding principles and implementation mechanisms for adaptation to climate change in Europe. The paper is based on opinions from more than 250 adaptation experts from 35 European countries, who took part in a survey conducted by the Potsdam Institute for Climate Impact Research and Effect.

More than 400 technical experts and policy makers met in Cairo, Egypt, November 2-3, at the Fifth Symposium on ICTs and the Environment & Climate Change (ICT = Information and Communication Technologies). Emphasizing the climate change monitoring and mitigation requirements of Africa and other developing regions that can be met through ICT solutions, the symposium issued the –Cairo Roadmap,” a six-step program for the use of ICTs to benefit environmental management.

#### 6.7.5 Health

The WHO has published the report of the consultation on Essential Public Health Package to Enhance Climate Resilience in Least Developed Countries. The consultation was held in September 2010, in Geneva, Switzerland, with representatives from vulnerable countries, the

UNFCCC Secretariat, and relevant WHO departments. There was broad agreement on enhancing resilience through linking environment and health surveillance, vector control, and disaster risk reduction.

#### 6.7.6 Post-Copenhagen Negotiations

An update analysis on CO<sub>2</sub> emissions shows the global CO<sub>2</sub> emissions' decrease in 2009 by 1.3% appears to be only a "blip" on the radar due to the economic slowdown, with the emissions expected to return to the 3% yearly increase as the effects of the recession decline. The study also highlights that in 2009, while developed countries' carbon emissions fell—e.g. Japan (11.8%), United Kingdom (8.6%) and Germany (7%), they increased considerably in developing countries, mainly in China (8%) and India (6.2%).

As world attention turns towards the UN Climate Change Conference to be held in Cancun, Mexico, November 29-December 10, 2010, expectations of reaching agreement for a post-Kyoto greenhouse gas emissions treaty are low. Nevertheless, the high-profile meeting galvanized efforts and created the opportunity for holding many side-events that are all oriented toward improving energy efficiency, reducing GHG emissions, and promoting green technologies.

#### **Military and Security Implications:**

[Same as previous on this issue] The military should identify all its resources and programs for reducing GHGs and responding to effects of climate change, update information continuously, forecast how it might be called upon for both mitigation and adaptation, and perform a gap analysis in anticipation of future requests. International discourse over climate change is increasing the development of international policies and strategies to mitigate and adapt to climate change.

**Sources:** (see an expanded list in the [Appendix](#))

Benin suffers worst floods since 1963

<http://www.guardian.co.uk/world/2010/oct/25/benin-worst-floods-since-1963>

*Natural Hazards, UnNatural Disasters: The Economics of Effective Prevention*

<http://www.gfdrr.org/gfdrr/node/281>

Food Outlook report

<http://www.fao.org/docrep/013/a1969e/a1969e00.pdf>

Global Conference on Agriculture, Food Security and Climate Change

<http://www.afcconference.com/>

Africa Water Atlas

<http://na.unep.net/atlas/africaWater/book.php>

Kiribati's Tarawa Climate Change Conference (TCCC)

[http://www.climate.gov.ki/tarawa\\_climate\\_change\\_conference.html](http://www.climate.gov.ki/tarawa_climate_change_conference.html)

Guiding principles for adaptation to climate change in Europe ETC/ACC Technical Paper 2010/6

[http://air-climate.eionet.europa.eu/reports/ETCACC\\_TP\\_2010\\_6\\_guid Princ\\_cc\\_adapt](http://air-climate.eionet.europa.eu/reports/ETCACC_TP_2010_6_guid Princ_cc_adapt)

Essential Public Health Package, Consultation Report

[http://www.who.int/globalchange/mediacentre/events/2010/EssentialPublicHealthPackage\\_September\\_2010\\_Consultation\\_Meeting\\_Report.pdf](http://www.who.int/globalchange/mediacentre/events/2010/EssentialPublicHealthPackage_September_2010_Consultation_Meeting_Report.pdf)

Update on CO<sub>2</sub> emissions. Nature Geoscience, 21 November 2010, doi:10.1038/ngeo1022

<http://www.nature.com/ngeo/journal/vaop/ncurrent/full/ngeo1022.html>

United Nations Climate Change Conference Cancun - COP 16 & CMP 6

<http://unfccc.int/2860.php>

## 6.8 Nanotechnology Safety Issues

More detailed descriptions of the following nanotechnology issues are in the [Appendix](#)

- *Nanotechnology Research Directions for Societal Needs in 2020* by Wilson Center/Pew Trusts' Project on Emerging Nanotechnologies ([more](#))
- *International Handbook on Regulating Nanotechnologies* ([more](#))
- Two white papers on nanotechnology regulation by the Chemical Heritage Foundation's Studies in Sustainability series ([more](#)):
  - Emerging Nanotechnologies and Life-Cycle Regulation: An Investigation of Federal Regulatory Oversight from Nanomaterial Production to End of Life
  - Nanotechnology Regulation: Policies Proposed by Three Organizations for the Reform of the Toxic Substances Control Act
- Regulation of Products Containing Nanoscale Materials by lexology.com ([more](#))
- *Voluntary Initiatives, Regulation, and Nanotechnology Oversight: Charting a Path*, by the Wilson Center/Pew Trusts' Project on Emerging Nanotechnologies ([more](#))
- Key issues for nanomaterial definition ([more](#))
  - International Council of Chemical Associations advocates five 'Core Elements of a Regulatory Definition of Manufactured Nanomaterial.
  - Reaction of the Center for International Environmental Law and European Environmental Bureau to the European Commission's proposed definition of "nanomaterial"
- *Nanoscience Education, Workforce Training, and K-12 Resources*, addresses nanotechnology education and workforce training ([more](#))
- Studies Discussing the Possibility of Understanding Nanotoxicology ([more](#))
  - DuPont Haskell Global Centers for Health and Environmental Sciences about myths and misconceptions regarding nanotoxicology
  - German Federal Environment Agency concludes, "...current knowledge is insufficient for making any generalised statements which are relevant for risk assessment."
- Structured relationship modeling for prediction of nanoparticle properties ([more](#))
- Risk Analysis devotes November 2010 issue to nanotechnology ([more](#))

## Item 7. Reports and Information Suggested for Review

### 7.1 Literature Addressing Arctic Security

*Protecting the Arctic Biodiversity: Limitations and Strengths of Environmental Agreements*, a report by UNEP, assesses the status and adequacy of current multilateral environmental agreements that deal with protecting the Arctic from the effects of climate change. It underlines that changes in Arctic biodiversity also impact neighboring countries and regions, given the migratory nature of many of the Arctic species, and that global effort is needed to address climate change causes and effects. Challenges include the generally outdated nature of the MEAs—based on past understandings of the Arctic environment—as well as insufficient implementation, which makes it difficult to assess progress and adequacy. Recommendations include: an audit of the MEAs on the Arctic to assess their effectiveness, relevance, and options for improvement, as new actors become involved in the Arctic and its resources; and an increased role of the Arctic Council to ensure sustainable use of the Arctic.

*The Arctic Sea Competition and Key Strategic Challenges for Europe.* an article published in *Second Line of Defense* summarizes the present state of affairs in the Arctic, highlighting its economic and strategic importance.

*The Canadian Arctic: Threat from Terrorists and Extremists.* a newly declassified intelligence assessment, prepared by the Integrated Threat Assessment Centre, claims that in recent years, vessels with links to human smuggling, drug trafficking, and organized crime have attempted to access the Canadian Arctic. It also notes that over the past 10 years, the population of the Canadian Arctic increased by 16%. Visitors to the area have also increased, including cruise ships, tourists, and peace activists, leading federal agencies to increase monitoring of incoming people, goods, and threats from the North.

The *Security in Canada's North: Looking Beyond Arctic Sovereignty* report by the Conference Board of Canada suggests "community security" should be considered instead of only military sovereignty.

### **Military and Related Security Implications:**

Military and security personnel associated with the Arctic should review these reports for conflict prevention and support to police implications.

### **Sources:**

Global action needed to conserve Arctic biodiversity

<http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=649&ArticleID=6800&l=en&t=long>

Protecting Arctic Biodiversity: Limitations and strengths of environmental agreements

<http://www.grida.no/publications/arctic-biodiversity/>

The Arctic Sea Competition and Key Strategic Challenges for Europe (Part One)

<http://www.sldinfo.com/?p=11635>

Arctic terror threats real: security agencies

<http://www.cbc.ca/canada/north/story/2010/11/10/cp-arctic-security-threats.html>

Climate change a top fear in North: report

<http://www.cbc.ca/canada/north/story/2010/11/16/arctic-security-conference-board.html>

## **7.2 Economic Argument for Peace-building in Sudan**

A recent publication by Frontier Economics suggests that the January 2011 Southern Sudanese referendum on independence could cost Sudan, regional neighbors, and international agencies more than \$100 billion over 10 years (and over \$800 billion in 25 years), if the vote results in civil war. The study looks at different conflict scenarios within varying baseline contexts; assessing economic outcomes of impacts on infrastructure, oil production, peacekeeping, and humanitarian aid.

### **Military and Related Security Implications:**

AFRICOM and security personnel associated with Sudan should review this report and use its data as a case for ongoing conflict prevention and capacity-building programs.

### **Sources:**

Return to conflict in Sudan could cost in excess of US\$100 billion

<http://www.frontier-economics.com/europe/en/news/1028/>

The cost of future conflict in Sudan

[http://www.frontier-economics.com/\\_library/pdfs/frontier%20report%20-%20the%20cost%20of%20future%20conflict%20in%20sudan.pdf](http://www.frontier-economics.com/_library/pdfs/frontier%20report%20-%20the%20cost%20of%20future%20conflict%20in%20sudan.pdf)

## APPENDIX

### Reference Details

This Appendix contains expanded background information on some items.

### Item 6. Updates on Previously Identified Issues

#### 6.7 Climate Change

**Sources:** (a more expanded list)

##### 6.7.1 Scientific Evidence and Natural Disasters

Flood-Devastated Benin Requests Millions for Emergency Aid

<http://www.circleofblue.org/waternews/2010/world/africa/flood-devastated-benin-requests-millions-for-emergency-aid/>

Benin suffers worst floods since 1963

<http://www.guardian.co.uk/world/2010/oct/25/benin-worst-floods-since-1963>

*Natural Hazards, UnNatural Disasters: The Economics of Effective Prevention*

<http://www.gfdrr.org/gfdrr/node/281>

##### 6.7.2 Food and Water Security

The United Nations had previously projected that grain yields would grow 1.2% this year. Food Outlook report

<http://www.fao.org/docrep/013/al969e/al969e00.pdf>

One trillion food import bill as prices rise

<http://www.fao.org/news/story/en/item/47733/icode/>

World ‘Dangerously Close’ to Food Crisis, U.N. Says

<http://green.blogs.nytimes.com/2010/11/24/world-dangerously-close-to-food-crisis-u-n-says/>

It’s Down 2 Earth - Global Conference on Agriculture, Food Security and Climate Change

<http://www.iisd.ca/ymb/afconference>

Global Conference on Agriculture, Food Security and Climate Change

<http://www.afconference.com/>

Roadmap for Action

<http://www.afconference.com/final-roadmap-for-action>

FAO site on climate-smart agriculture

<http://www.fao.org/climatechange/climatesmart/en/>

New atlas shows Africa's vulnerable water resources in striking detail

<http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=651&ArticleID=6843&I=en&t=long>

Africa Water Atlas

<http://na.unep.net/atlas/africaWater/book.php>



### 6.7.3 Migration

Kiribati's Tarawa Climate Change Conference (TCCC)

[http://www.climate.gov.ki/tarawa\\_climate\\_change\\_conference.html](http://www.climate.gov.ki/tarawa_climate_change_conference.html)

### 6.7.4 Adaptation

Guiding principles for adaptation to climate change in Europe ETC/ACC Technical Paper 2010/6

[http://air-climate.eionet.europa.eu/reports/ETCACC\\_TP\\_2010\\_6\\_guid\\_princ\\_cc\\_adapt](http://air-climate.eionet.europa.eu/reports/ETCACC_TP_2010_6_guid_princ_cc_adapt)

ITU Symposium on ICTs and the Environment & Climate Change

<http://www.itu.int/ITU-T/worksem/climatechange/201011/>

### 6.7.5 Health

Geneva consultation on Essential Public Health Package to Enhance Climate Resilience in Least Developed Countries

[http://www.who.int/globalchange/mediacentre/events/2010/geneva\\_consultation\\_07092010/en/index.html](http://www.who.int/globalchange/mediacentre/events/2010/geneva_consultation_07092010/en/index.html)

Essential Public Health Package, Consultation Report

[http://www.who.int/globalchange/mediacentre/events/2010/EssentialPublicHealthPackage\\_September\\_2010\\_Consultation\\_Meeting\\_Report.pdf](http://www.who.int/globalchange/mediacentre/events/2010/EssentialPublicHealthPackage_September_2010_Consultation_Meeting_Report.pdf)

### 6.7.6 Post-Copenhagen Negotiations

Update on CO<sub>2</sub> emissions. Nature Geoscience, 21 November 2010, doi:10.1038/ngeo1022

<http://www.nature.com/ngeo/journal/vaop/ncurrent/full/ngeo1022.html>

United Nations Climate Change Conference Cancun - COP 16 & CMP 6

<http://unfccc.int/2860.php>

## **6.8 Nanotechnology Safety Issues**

More detailed descriptions of the nanotechnology issues

### 6.8.1 Report Outlines Nanotech Research Directions for Societal Needs in 2020

The Wilson Center/Pew Trusts' Project on Emerging Nanotechnologies has issued a new report, *Nanotechnology Research Directions for Societal Needs in 2020*, that, according to Meridian *Nanotechnology and Development News*, "...outlines the foundational knowledge and infrastructure development in the last decade, the current ~\$15 billion in R&D programs underpinning about \$250 billion of products incorporating nanoscale components in the world in 2009, and the likely evolution towards a general purpose technology by 2020."

#### **Military and Related Security Implications:**

This report, drawing on the opinions of leading experts from over 35 countries, should provide useful information for the long-range planning of nanotech assessment.

#### **Sources:**

Nanotechnology Research Directions for Societal Needs in 2020

<http://www.nanotechproject.org/events/archive/researchdirections/>

Nanotechnology Research Directions for Societal Needs in 2020

<http://sites.merid.org/nanodev/more.php?articleID=2986>

#### 6.8.2 International Handbook on Regulating Nanotechnologies

A new 648-page *International Handbook on Regulating Nanotechnologies* seems to be a comprehensive examination of the regulatory challenges presented by nanotechnologies, with speculations on potential future evolution of the regulatory landscape, including, “potential legislative responses that could be employed by governments [and] a range of other options available to stakeholders,” says the press release.

##### **Military and Related Security Implications:**

The Handbook could be a useful tool to those concerned with nano-related environmental health and safety regulatory issues, as well as effects of any restrictions on the material uses of nano-products.

##### **Source:**

International Handbook on Regulating Nanotechnologies

<http://2020science.org/international-handbook-on-regulating-nanotechnologies/>

#### 6.8.3 Chemical Heritage Foundation Issues Two Reports on Nanotech Regulation

The Chemical Heritage Foundation’s Studies in Sustainability series has issued two white papers on nanotechnology regulation. The two titles are *Emerging Nanotechnologies and Life-Cycle Regulation: An Investigation of Federal Regulatory Oversight from Nanomaterial Production to End of Life* and *Nanotechnology Regulation: Policies Proposed by Three Organizations for the Reform of the Toxic Substances Control Act*.

##### **Military and Related Security Implications:**

The reports should provide useful summaries of the current state of these aspects of the regulatory process.

##### **Sources:**

Emerging Nanotechnologies and Life-Cycle Regulation: An Investigation of Federal Regulatory Oversight from Nanomaterial Production to End of Life

<http://issuu.com/chemheritage/docs/emerging-nanotechnologies?viewMode=presentation&mode=embed>

Nanotechnology Regulation: Policies Proposed by Three Organizations for the Reform of the Toxic Substances Control Act

<http://issuu.com/chemheritage/docs/nanotechnology-regulation?viewMode=presentation&mode=embed>

#### 6.8.4 Regulation of Products Containing Nanoscale Materials

According to Meridian *Nanotechnology and Development News*, this article, prepared by lexology.com, addresses regulatory issues of nanotechnology and takes an in-depth look at how the EPA, FDA, and OSHA, “...have dealt with nanotechnology regulation since a November 2007 memorandum from the Office of Science and Technology Policy, and the Council on Environmental Quality, stated that federal agencies ‘must implement sound policies to protect public health and the environment’ from risks related to nanotechnology.”

**Military and Related Security Implications:**

This excellently detailed article provides a very useful summary of the course of nanotech regulation in the USA.

**Sources:**

Regulation of Products Containing Nanoscale Materials

<http://sites.merid.org/nanodev/more.php?articleID=2979>

Regulation of products containing nanoscale materials

<http://www.lexology.com/library/detail.aspx?g=4b460c16-b0cc-4c05-972d-c9b152cf3400>

**6.8.5 Voluntary Initiatives, Regulation, and Nanotechnology Oversight: Charting a Path**

The Wilson Center/Pew Trusts' Project on Emerging Nanotechnologies has issued a 56-page report, *Voluntary Initiatives, Regulation, and Nanotechnology Oversight: Charting a Path*, that, according to the Project's director, —...is the most extensive analysis done to date of how voluntary programs can be applied to managing nanotechnology's possible environmental and health effects [with] ... analysis and recommendations [that] extend beyond nanotechnology to the newer generation challenges that we face as science rapidly advances.”

**Military and Related Security Implications:**

The Project's five years of experience in the development of a number of voluntary initiatives in this area should ensure that this report offers valuable guidance to nanotech regulation planners.

**Sources:**

Voluntary Initiatives, Regulation, and Nanotechnology Oversight: Charting a Path

<http://www.nanotechproject.org/events/archive/voluntary/>

PEN 19 - Voluntary Initiatives, Regulation, and Nanotechnology Oversight

<http://www.nanotechproject.org/publications/archive/voluntary/>

**6.8.6 Organizations Address Key Issues For Nanomaterial Definition**

According to *Nanowerk News*, "The International Council of Chemical Associations (ICCA) has released a document addressing key issues that need [to be] addressed when considering the definition of manufactured nanomaterials for regulatory purposes. It advocates five 'Core Elements of a Regulatory Definition of Manufactured Nanomaterial' ". The proposed elements are: solid, particulate substances, intentionally manufactured at the nano-scale, with at least one dimension between 1 and 100nm, and their aggregates and agglomerates, with a weight based cut-off of either 10 wt.-% or more of nano-objects or 50 wt- % or more of aggregates / agglomerates consisting of nano-objects.

The Center for International Environmental Law and the European Environmental Bureau submitted on behalf of a consortium of 46 organizations comments on the European Commission's proposed definition of "nanomaterial". The Reply begins by cautioning, —The present understanding of nanomaterials properties and potential health and environmental impacts is still very limited and therefore warrants much research and careful evaluation.”

**Military and Related Security Implications:**

These guidelines are likely to have a substantial effect on the formulation of the nanomaterial definition used in future regulations, and should be taken into account in planning for such regulation.

**Sources:**

International Council of Chemical Associations addresses key issues for nanomaterial definition  
<http://www.nanowerk.com/news/newsid=19145.php>

ICCA Core Elements of a Regulatory Definition of Manufactured Nanomaterials

[http://www.icca-chem.org/ICCADocs/Oct-2010\\_ICCA-Core-Elements-of-a-Regulatory-Definition-of-Manufactured-Nanomaterials.pdf](http://www.icca-chem.org/ICCADocs/Oct-2010_ICCA-Core-Elements-of-a-Regulatory-Definition-of-Manufactured-Nanomaterials.pdf)

Reply form for the public consultation on Proposal for a Commission definition of the term "nanomaterial"

[http://www.ciel.org/Publications/Nanomaterials\\_ReplyForm\\_Nov10.pdf](http://www.ciel.org/Publications/Nanomaterials_ReplyForm_Nov10.pdf)

**6.8.7 New Book Addresses Nanotechnology Education and Workforce Training**

According to an item in *Meridian Nanotechnology and Development News*, the new book *Nanoscience Education, Workforce Training, and K-12 Resources*, by Miguel Aznar, of the Foresight Institute, is divided into four parts:

- Historical perspective and the emerging technology
- Teaching the skills for understanding and evaluating the emerging technologies
- The current status of, and links to, teaching materials, and evaluation of the US model vs. elsewhere
- Plans of action and links to sustainable development tools

**Military and Related Security Implications:**

This work may provide useful ideas on communicating nanotech knowledge and understanding to outside audiences.

**Source:**

New Book Addresses Nanotechnology Education and Workforce Training

<http://www.foresight.org/nanodot/>

**6.8.8 Studies Discussing the Possibility of Understanding Nanotoxicology**

David B. Warheit from the DuPont Haskell Global Centers for Health and Environmental Sciences and colleagues has written an article addressing five issues that they perceive to be myths and misconceptions regarding nanotoxicology, generally related to the complex relationships, still the subject of much research, between the chemical and physical properties of nanomaterials and their biological effects. The emphasis of the paper is on the deficiencies in current knowledge and its application and the need for a very large amount of further detailed investigation before specific nanomaterials can be fully "trusted".

Similarly, a study paper produced by the German Federal Environment Agency (Umweltbundesamt) on the release and behavior of nanoparticles in the environment indicates, not too surprisingly, that the characteristics they exhibit depend on a multitude of factors, both of the material and the environment through which they pass – factors whose effects are as yet largely unknown in detail. The materials tested were nanosilver, titanium dioxide, carbon black, and cerium oxide. The study concludes, "...current knowledge is insufficient for making any generalised statements which are relevant for risk assessment."

**Military and Related Security Implications:**

These studies provide valuable information to those planning nanomaterial development and risk assessment.

**Sources:**

Nanotoxicology myth buster

<http://www.nanowerk.com/spotlight/spotid=18774.php>

Debunking Some Misconceptions about Nanotoxicology. David B. Warheit, DOI:

10.1021/nl103432w

<http://pubs.acs.org/action/doSearch?action=search&author=warheit&qSearchArea=author&type=within&publication=40026042&> (Abstract)

"Study of nanoparticle emission of selected products during their life cycle" (English summary)

[http://www.umweltbundesamt.de/technik-verfahren-sicherheit-e/publikationen/texte\\_52\\_2010\\_kurzfassung\\_e.pdf](http://www.umweltbundesamt.de/technik-verfahren-sicherheit-e/publikationen/texte_52_2010_kurzfassung_e.pdf)

**6.8.9 Structured Relationship Modeling Allows Prediction of Nanoparticle Properties**

Scientists led by Prof. Alexander Tropsha of the Univ. of NC School of Pharmacy have developed a structured modeling technique by which the biological effects of manufactured nanoparticles (MNPs) can be predicted using their chemical, physical, and geometrical properties.

**Military and Related Security Implications:**

If this technique lives up to its promise, it should prove of considerable assistance in designing new nanoparticles and assessing their risks.

**Sources:**

Predicting the toxicological effects of nanomaterials with novel modeling approach

<http://www.nanowerk.com/spotlight/spotid=18875.php>

Quantitative Nanostructure–Activity Relationship Modeling

<http://dx.doi.org/doi:10.1021/nl1013484>

**6.8.10 Risk Analysis Devotes November 2010 Issue to Nanotechnology**

The entire November 2010 issue of the journal Risk Analysis is devoted to risk analysis articles related to nanotechnology.

**Military and Related Security Implications:**

In-house and contractor ES personnel with nanotech risk assessment responsibilities should review this issue for pertinent discussions.

**Sources:**

An anticipatory governance approach to carbon nanotubes

<http://www.nanowerk.com/news/newsid=19037.php>

Risk Analysis. Volume 30, Issue 11, Pages 1627–1734 (full text by purchase or subscription)

<http://onlinelibrary.wiley.com/doi/10.1111/risk.2010.30.issue-11/issuetoc>